Middle Eel River

Watershed Management Plan

SECTION 6

LOADS, GOALS, OBJECTIVES AND RESOURCES

1/14/11

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6.0 Key Issues and Concerns

The Steering Committee identified 3 key issues as top priority concerns in the watershed:

1) Degraded water quality that has concentrations above state standards in:
    a. Total Suspended Solids
    b. Nutrients: Nitrogen and Total Phosphorus
    c. E. coli
2) Degraded habitat for the biological community
3) Impaired biotic comminuties

This is a data driven plan, the magnitude of the water quality concerns within the watershed are a reflection of the water monitoring program. It is important to note that there is no one practice that can solve the concerns within the watershed. It will be necessary to implement a variety of practices throughout the watershed for improvement in water quality, biological community, and habitat. BMPs targeting the above mentioned parameters of concern are listed in Figure 6-1. Current load calculation are listed in Tables 6-1 through 6-8 and load reductions necessary to meet the goals are listed in Tables 6-9 through 6-14.

6.1 Load Calculations for Testing Tributaries

Daily and annual loads for ammonia, nitrate and total phosphorus (Lbs/day/year) for 2010 were calculated for each of the six testing tributaries and are shown below. TSS loads are calculated in tons per day/year. Load estimations are based on data collected during the 2010 field season. The field season runs from May 1 – June 31 and includes the time when the agricultural community is most active and represents the highest loading of the year. Consequently, when extrapolated to an annual load, the daily loads will be somewhat skewed as the parameters of concern will be the highest during the field season.

Table 6-1. Middle Eel River Watershed testing tributaries ammonia (lbs/day/year) median, maximum, minimum and subwatershed acreage, May 7-July 29, 2010.

Ammonia Pounds per Day/Year 2010 Field Season (May-July)						
	Silver Creek	Squirrel Creek	Weesau Creek	Flowers Creek	Paw Paw Creek	Beargrass Creek
Median (lbs/day)	13	11	8	2	12	8
Annual Load (lbs/yr)	4,745	4,015	2,920	730	4,380	2,920
Maximum	93	125	78	28	205	366
Minimum	2	0	0	0	1	0
Acreage	20,163	15,192	14,853	13,581	35,118	14,793

Table 6-2. Middle Eel River Watershed testing tributaries nitrate (lbs/day/year) median, maximum, minimum and subwatershed acreage, May 7-July 29, 2010.

Nitrate Pounds per Day/Year 2010 Field Season (May-July)						
	Silver Creek	Squirrel Creek	Weesau Creek	Flowers Creek	Paw Paw Creek	Beargrass Creek
Median (lbs/day)	489	558	669	244	1,765	1,077
Annual Load (lbs/yr)	178,485	203,670	244,185	89,060	644,225	393,105
Maximum	1,651	3,530	2,713	1,417	5,715	8,467
Minimum	58	0	0	0	17	0
Acreage	20,163	15,192	14,853	13,581	35,118	14,793

Table 6-3. Middle Eel River Watershed testing tributaries total phosphorus (lbs/day/year) median, maximum, minimum and subwatershed acreage, May 7-July 29, 2010.

Total Phosphorus Pounds per Day/Year 2010 Field Season (May-July)						
	Silver Creek	Squirrel Creek	Weesau Creek	Flowers Creek	Paw Paw Creek	Beargrass Creek
Median (lb/day)	102	76	55	18	99	71
Annual Load (lbs/yr)	37,230	27,740	20,075	6,570	36,135	25,915
Maximum	571	576	862	214	1,776	1,955
Minimum	0	0	0	0	5	0
Acreage	20,163	15,192	14,853	13,581	35,118	14,793

Table 6-4. Middle Eel River Watershed testing tributaries TSS (lbs/day/year) median, maximum, minimum and subwatershed acreage, May 7-July 29, 2010.

TSS Tons per Day/Year 2010 Field Season (May-July)						
	Silver Creek	Squirrel Creek	Weesau Creek	Flowers Creek	Paw Paw Creek	Beargrass Creek
Median (tons/day)	3.7	1.4	1.0	.05	1.2	0.6
Annual Load (tons/yr)	1,359	525	402	182	424	215
Maximum	31	36	53	10	120	159
Minimum	163	0	0	0	0	0
Acreage	20,163	15,192	14,853	13,581	35,118	14,793

6.2 Load Calculations for Mainstem Gage Stations

Daily and annual loads of ammonia, nitrate and total phosphorus (Lbs/day/year) for 2010 were calculated for each of the gage stations and are shown below. TSS loads are calculated in tons per day/year. Load estimations are based on data collected during the 2010 field season. The field season runs from May 1 – June 31 and includes the time when the agricultural community is most active and represents the highest loading of the year. Consequently, when extrapolated to an annual load, the daily loads will be somewhat skewed as the parameters of concern will be the highest during the field season. It is important to note that ammonia, total phosphorus and TSS decrease as they move through the Middle Eel River Watershed indicating the need to focus on the upper reaches of the Eel River Watershed. In order to decrease the loads of ammonia, total phosphorus, and TSS, watershed management plans will need to be written and implemented within the upper reaches of the Eel River Watershed.

Table 6-5. Middle Eel River Watershed mainstem gage stations ammonia (lbs/day/year) median, maximum, minimum and subwatershed acreage, May 7-July 29, 2010.

Ammonia Pounds per Day/Year 2010 Field Season (May-July)			
	Blocher Gage	Paw Paw Gage	Mexico Gage
Median (lbs/day)	231	228	225
Annual Load (lbs/yr)	84,315	83,220	82,125
Maximum	9,602	4,879	5,121
Minimum	0	37	37
Acreage	92,442	120,179.5	49,192.8

Table 6-6. Middle Eel River Watershed mainstem gage stations nitrate (lbs/day/year) median, maximum, minimum and subwatershed acreage, May 7-July 29, 2010.

Nitrate Pounds per Day/Year 2010 Field Season (May-July)			
	Blocher Gage	Paw Paw Gage	Mexico Gage
Median (lbs/day)	10,244	11,906	12,802
Annual Load (lbs/yr)	3,739,060	4,345,690	4,672,730
Maximum	91,743	74,303	75,923
Minimum	578	248	330
Acreage	92,442	120,179.5	49,192.8

Table 6-7. Middle Eel River Watershed mainstem gage stations total phosphorus (lbs/day/year) median, maximum, minimum and subwatershed acreage, May 7-July 29, 2010.

Total Phosphorus Pounds per Day/Year 2010 Field Season (May-July)			
	Blocher Gage	Paw Paw Gage	Mexico Gage
Median (lbs/day)	2,085	2,287	1,947
Annual Load (lbs/yr)	761,025	834,755	710,655
Maximum	82,071	47,823	38,952
Minimum	288	233	165
Acreage	92,442	120,179.5	49,192.8

Table 6-8. Middle Eel River Watershed mainstem gage stations TSS (lbs/day/year) median, maximum, minimum and subwatershed acreage, May 7-July 29, 2010.

TSS Tons per Day/Year 2010 Field Season (May-July)			
	Blocher Gage	Paw Paw Gage	Mexico Gage
Median (tons/day)	72	71	68
Annual Load (tons/yr)	26,249	25,761	24,688
Maximum	1.2	1.9	2.9
Minimum	0	1.2	1.3
Acreage	92,442	120,179.5	49,192.8

6.3 Goals The Steering Committee determined the following goals:

Problem Statement: High levels of nitrogen and phosphorus are present in the Watershed.

Goal 1: Reduce nitrogen and total phosphorus in the Middle Eel River Watershed Short term goals: 1-3 years					
Goal/Objective	**Action Item**	**Responsibility**	**Schedule**	**Indicators of Success**	**Cost Estimate**
Decrease nitrogen and total phosphorus in mainstem and tributaries	Develop and implement a cost-share program to assist with implementation of best management practices.	**Watershed Coordinator**	Complete development of cost-share program for IDEM approval by December 31, 2010	Cost-share program approval by IDEM	$60,000
	Implement BMPs targeted to reduce nitrogen and phosphorus including: nutrient management plans, variable rate technology, soil testing, conservation tillage, cover crops, grassed waterways, stream buffers and riparian corridor enhancement.	**NRCS, SWCDs** **Watershed Coordinator**	Contacts and agreements in by 2011, implementation of BMPs by December 31, 2012 Continue water monitoring as outlined in the QAPP	Number of agreements entered into with land owners. Document downward trend in nitrogen and total phosphorus in tributaries and mainstem	$212,000 $50,000 Annually
Foster interest in and educate the public on nonpoint sources of nutrients in the Middle Eel River Watershed	Encourage BMP's through educational events targeting the agricultural and urban community, focusing on BMPs that reduce nitrogen and phosphorus use.	**Watershed Coordinator, NRCS, SWCDs**	Hold 3 field days focusing on nonpoint source nutrients targeting the agricultural and urban community.	Number of field days and number of participants	Approx $750.00 Annually
Foster interest in and educate the public regarding the national impact of excessive nutrients	Hold public meetings to share water monitoring results with the public and progress in terms of BMPs installed or scheduled. Discussion will include local and national concerns regarding nutrient loading.	**Watershed Coordinator**	Annual meeting to educate and inform the public 2011 & 2012	Number of people attending the annual meeting	Approx $200 Annually

Goal #1: Reduce Nitrogen and Phosphorus in the Middle Eel River Watershed.

Short Term Goal: 1-3 years:

Document downward trend in Nitrogen and Total Phosphorus levels in critical areas (priority and secondary) (Figure 5-1).

Intermediate Term Goal: 3-15 years:

Reduce nitrogen, total phosphorus and to 50% of USEPA Recommended targets, nitrate maximum of 1.266 mg/L and total phosphorus maximum of 0.152 mg/L in the critical areas (Figure 5-1).

Action:

Continue implementation of BMPs throughout the watershed by partnering with the Mississippi River Basin Initiative ($2.9M)

Develop watershed management plans to include the entire Eel River Watershed (See page 3-54) (HUC - 05120104). Approx cost: $3M

Continue water monitoring in the Middle Eel River to determine effectiveness of BMPs. Approx. cost: $50,000 annually

Long Term Goal: 16-30 years:

Reduce nitrogen and total phosphorus to meet USEPA Recommended targets of nitrate maximum of 0.633 mg/L and total phosphorus maximum of 0.076 mg/L in the water as it exists the Middle Eel River Watershed (Figure 5-1).

Action:

Implementation of watershed management plans upstream of the Middle Eel River Watershed (HUC – 05120104).

Approximate cost: $5-10M

Continue implementation of BMPs that will be identified in additional watershed management plans.

Continue water monitoring in the Middle Eel River to determine effectiveness of BMPs. Approx. cost: $50,000 annually

Problem Statement: Elevated *E. coli* levels are present in the Watershed.

Goal 2: Reduce *E. coli* in the Middle Eel River Watershed Short Term Goals: 1-3 years					
Goal/Objective	**Action Item**	**Responsibility**	**Schedule**	**Indicators of Success**	**Cost Estimate**
Reduce *E. coli* in the tributaries and mainstem	Develop and implement a cost-share program to assist with implementation of best management practices that reduce *E. coli*.	**Watershed Coordinator**	Complete development of cost-share program for approval by IDEM by December 31, 2010	Cost-share program approval by IDEM	$60,000
Foster interest in and educate the public on nonpoint sources of *E. coli* in the Middle Eel River Watershed	Implement BMPs targeted to reduce *E. coli*	**NRCS, SWCDs**	Contacts and agreements in by 2011, implementation of BMPs by December 31, 2012	Number of agreements entered into with landowners.	$212,000 (Cost-Share Funds from current 319.)
	Encourage BMP's through educational events targeting the agricultural and urban community, focusing on nutrient management, soil testing, conservation tillage, cover crops, grassed waterways, stream buffers, prescribed grazing, livestock exclusion from waterways, waste storage facilities, composting facilities, equipment modification and anaerobic digesters.	**Watershed Coordinator, NRCS, SWCDs**	Hold1 field day targeting the agricultural community and BMPS that reduce *E. coli* in 2011.	Number of field days and number of participants	$750.00 Annually
		Watershed Coordinator	Continue water monitoring as outlined in the QAPP	Demonstrate downward trend of *E. coli* in the testing tributaries and mainstem	$50,000.00 Annually
	Hold public meetings to share water monitoring results with the public and progress in terms of BMPs installed or scheduled. Encourage proper septic system care and maintenance through education and outreach	**Local or state Board of Health and IDEM**	Annual meeting to educate and inform the public 2011 & 2012	Number of people attending the annual meeting	$250.00 Annually
	Support Laketon in pursuing Waste Water Treatment Facility	**Watershed Coordinator**	Watershed Coordinator to continue to work with the Laketon group throughout the process of implementing waste water treatment facility.	Installation of waste water treatment facility in Laketon	N/A

Goal #2: Reduce *E. coli* in the critical areas (Figure 5-1).

Short Term Goal: 1-3 years

Document downward trend in *E. coli* in critical areas (priority and secondary)(Figure 5-1).

Intermediate Goal: 3 – 15 years

Reduce *E. coli* to 50% of Indiana State Standard, Single Sample 470 CFU/100mL, or geometric mean of 250 CFU/100mL in the critical areas (Figure 5-1).

Action:

Continue implementation of BMPs throughout the watershed by partnering with the Mississippi River Basin Initiative ($2.9M)

Develop watershed management plans to include the entire Eel River Watershed (See page 3-54) (HUC - 05120104). Approx cost: $3M

Continue water monitoring in the Middle Eel River to determine effectiveness of BMPs. Approx. cost: $50,000 annually

Long Term Goal: 15-30 Years

Meet Indiana Sate Standard for *E. coli* Single Sample 235 CFU/100mL, or geometric mean of 125 CFU/100mL in the water leaving the Middle Eel River Watershed.

Action:

Implementation of watershed management plans upstream of the Middle Eel River Watershed (HUC – 05120104).

Approximate cost: $5-10M

Continue implementation of BMPs that will be identified in additional watershed management plans.

Continue water monitoring in the Middle Eel River to determine effectiveness of BMPs. Approx. cost: $50,000 annually

Problem Statement: There are very high levels of Total Suspended Solids (TSS) within the Watershed.

Goal 3: Reduce total suspended sediment (TSS) in the Middle Eel River Watershed. Short Term Goals: 1-3 years					
Goal/Objective	**Action Item**	**Responsibility**	**Schedule**	**Indicators of Success**	**Cost Estimate**
Reduce total suspended sediment in tributaries and mainstem	Develop and implement a cost-share program to assist with implementation of best management practices that reduce TSS.	**Watershed Coordinator**	Complete development of cost-share program for approval by IDEM by December 31, 2010	Cost-share program approval by IDEM	$60,000
	Implement BMPs targeted to reduce TSS such as cover crops, conservation tillage, filter strips, grassed waterways, pasture and hay planting and critical area planting.	**NRCS, SWCDs**	Contacts and agreements in by 2011, implementation of BMPs by December 31, 2012	Enter into agreements with 15 land owners to install BMPS targeting TSS	$212,000(Cost-Share Funds from current 319.)
Foster interest in and educate the public on the damage TSS can do to stream ecosystem health.	Encourage BMP's through educational events targeting the agricultural community, focusing on suspended sediment.	**Watershed Coordinator, NRCS, SWCDs**	Hold 3 field days targeting the agricultural community and BMPS that reduce TSS.	Number of field days and number of participants	$750.00 Annually
	Hold public meetings to share water monitoring results with the public and progress in terms of BMPs installed or scheduled.	**Watershed Coordinator**	Continue water monitoring as outlined in the QAPP Annual meeting to educate and inform the public 2011 & 2012	Demonstrate downward trend of TSS in the testing tributaries and mainstem Number of people attending the annual meeting	$50,000.00 Annually $200.00 Annually

Goal #3: Reduce Total Suspended Solids in the critical areas (priority and secondary)(Figure 5-1).

Short Term Goal: 1-3 years

Document downward trend in TSS in critical areas (priority and secondary) (Figure 5-1).

Intermediate goal: 3-15 years

Reduce TSS to maximum 50 mg/L in the critical areas (Figure 5-1).

Action:

Continue implementation of BMPs throughout the watershed by partnering with the Mississippi River Basin Initiative ($2.9M)

Develop watershed management plans to include the entire Eel River Watershed (See page 3-54) (HUC - 05120104). Approx cost: $3M

Continue water monitoring in the Middle Eel River to determine effectiveness of BMPs. Approx. cost: $50,000 annually

Long Term Goal: 15-30 years

Reduce TSS to maximum of 25 mg/L of Total Suspended Solids in the water leaving the Middle Eel River Watershed.

Action:

Implementation of watershed management plans upstream of the Middle Eel River Watershed (HUC – 05120104).

Approximate cost: $5-10M

Continue implementation of BMPs that will be identified in additional watershed management plans.

Continue water monitoring in the Middle Eel River to determine effectiveness of BMPs. Approx. cost: $50,000 annually

Problem Statement: There are impaired biotic communities and degraded habitat in the watershed.

Goal 4: Improve biotic habitat and fish communities in the Middle Eel River Watershed. Short Term Goals: 1-3 Years					
Goal/Objective	**Action Item**	**Responsibility**	**Schedule**	**Indicator of Success**	**Cost Estimate**
Improve biotic habitat and fish communities in tributaries and the mainstem	Develop and implement a cost-share program to assist with implementation of best management practices that improve biotic habitat and fish communities.	**Watershed Coordinator**	Complete development of cost-share program for approval by IDEM by December 31, 2010	Cost-share program approval by IDEM	$60,000
	Implement BMPs targeted to improve the biotic habitat and fish communities such as cover crops, conservation tillage, filter strips, grassed waterways, pasture and hay planting, critical area planting, nutrient management, stream buffers, prescribed grazing, and livestock exclusion from waterways	**NRCS, SWCDs**	Contacts and agreements in by 2011, implementation of BMPs by December 31, 2012	Enter into agreements with 5 land owners to install BMPS targeting improved biotic habitat	$212,000(Cost-Share Funds from current 319.)
	Encourage BMP's through educational events targeting the agricultural and urban community, focusing impaired biotic communities and habitat availability	**Watershed Coordinator, NRCS, SWCDs**	Hold 3 field days targeting the agricultural community and BMPS that improve biotic community and/or habitat by Dec. 31, 2012.	Number of field days and number of participants	$750.00 Annually
	Hold public meetings to share water monitoring results with the public and progress in terms of BMPs installed or scheduled.	**Watershed Coordinator**	Continue water monitoring as outlined in the QAPP Annual meeting to educate and inform the public 2011 & 2012	Demonstrate improved biotic community and habitat through QHEI and IBI scores in the critical subwatersheds. Number of meetings and participants attending the annual meeting	$35,000.00 Annually $200.00 Annually

Goal #4: Improve biotic habitat and fish communities in the tributaries and mainstem.

Sort Term Goals: 1-3 years

Document upward trend in IBI and QHEI scores in critical areas (priority and secondary) (Figure 5-1).

Intermediate Goal: 3-15 years

Improve IBI scores to the good category (range of 48-52) and QHEI scores to 55 in critical areas

(Figure 5-1).

Action:

Continue implementation of BMPs throughout the watershed by partnering with the Mississippi River Basin Initiative ($2.9M)

Develop watershed management plans to include the entire Eel River Watershed (See page 3-54) (HUC - 05120104). Approx cost: $3M

Continue water monitoring in the Middle Eel River to determine effectiveness of BMPs. Approx. cost: $50,000 annually

Long Term Goal: 15-30 years

Attain IBI scores in the good to excellent category: total IBI score within the range of 48-60

Attain QHEI scores in the range providing suitable habitat for warm water aquatic life: total QHEI score within the range of 60 to 100

Action:

Implementation of watershed management plans upstream of the Middle Eel River Watershed (HUC – 05120104).

Approximate cost: $5-10M

Continue implementation of BMPs that will be identified in additional watershed management plans.

Continue water monitoring in the Middle Eel River to determine effectiveness of BMPs. Approx. cost: $50,000 annually

Problem Statement: There is a lack of public awareness of the impact of nonpoint source pollution and the watershed concept.

Goal 5: Increase public awareness of impacts of nonpoint source pollution and the watershed concept. Short Term Goals: 1-3 years					
Goal/Objective	**Action Item**	**Responsibility**	**Schedule**	**Indicators of Success**	**Cost Estimate**
Increase the public's understanding of nonpoint source pollution and the watershed concept.	Hold public meetings to educate the public	**Watershed Coordinator**	Annual meeting to educate and inform the public 2011 & 2012	Number of people attending the annual meeting	$200.00 Annually
	Create brochures to handout at fairs and various other locations	**Watershed Coordinator**	Create two new brochures for distribution by December 31, 2012	Brochures finished and distributed	Approx $200.00
	Update and maintain education opportunities at the North Manchester Center for History and the Stockdale Mill.	**Watershed Coordinator**	Maintain educational outreach materials through Dec. 31, 2012	Presence of displays	N/A
	Bi-annual newsletter	**Watershed Coordinator**	Create 2 newsletters annually	Number of newsletters published	Approx $200.00
	Website updates and management	**Watershed Coordinator**	Maintain website through Dec. 31, 2012	Website availability	N/A

Goal #5: Increase public awareness of the impacts nonpoint source pollution and the watershed concept.

Short Term Goal: 1-3 years

Educate landowners within the watershed about nonpoint source water quality concerns and solutions through newsletters, public meetings and outreach events.

A copy of the Watershed Management Plan will be sent to the County Commissioners and Planning Commissions in Wabash, Miami and Kosciusko counties.

A copy of the Watershed Management Plan will be sent to all libraries in Wabash, Miami and Kosciusko counties.

Intermediate Goal: 3-15 years

Educate landowners throughout the entire Eel River Watershed (HUC - 05120104) about nonpoint source water quality concerns and solutions through newsletters, public meetings and outreach events.

Action:

Continue implementation of BMPs throughout the watershed by partnering with the Mississippi River Basin Initiative ($2.9M)

Develop watershed management plans to include the entire Eel River Watershed (HUC - 05120104). Approx cost: $3M

Continue education and outreach at the same level as the short term goals.

Long term goals: 15-30 years

Educate landowners throughout the entire Eel River Watershed (HUC - 05120104) about nonpoint source water quality concerns and solutions through newsletters, public meetings and outreach events.

Action:

Implementation of watershed management plans upstream of the Middle Eel River Watershed (HUC – 05120104).

Approximate cost: $5-10M

Continue implementation of BMPs that will be identified in additional watershed management plans.

Continue water monitoring in the Middle Eel River to determine effectiveness of BMPs. Approx. cost: $50,000 annually

Continue education and outreach at the same level as the short term goals.

6.4 Estimated Load Reductions necessary to meet goals and BMP estimated effeciencies.

Data was analyzed for the Middle Eel River Watershed by determining the actual average loading per day (lbs/day/year) and comparing that to the average loading that would occur at the targets chosen for the Watershed Management Plan, this varies by parameter. The target, in mg/L, was inserted in place of the actual water monitoring data to determine loading at the target; TSS is calculated in tons/day/year. The result is the load reduction necessary to reach the target. **The Mexico Gage Station, which is the last monitoring location before the Eel River leaves the Middle Eel River Watershed, was used because it includes the accumulation of pollutants from the entire Watershed.**

The Steering Committee determined BMPs eligible for the Cost-Share Program that focus on reducing TSS, nitrates, phosphorus, and *E. coli*, with additional points granted for a systems approach that would include a combination of cover crops, low or no-till, and precision application of nutrients.

The estimated pollutant load reduction for Streambank Stabilization and Fencing, Filter Strips, Reduced Tillage and Waste Management BMPs are displayed in Table 6-9 through 6-14. Load reductions for all of the BMPs chosen by the Steering Committee are not available. Estimated load reductions were calculated using the Spreadsheet Tool for Estimating Pollutant Load.

> "STEPL**Spreadsheet Tool for Estimating Pollutant Load** (STEPL) employs simple algorithms to calculate nutrient and sediment loads from different land uses and the load reductions that would result from the implementation of various best management practices (BMPs).STEPL provides a user-friendly Visual Basic (VB) interface to create a customized spreadsheet-based model in Microsoft (MS) Excel. It computes watershed surface runoff; nutrient loads, including nitrogen, phosphorus, and 5-day biological oxygen demand (BOD5); and sediment delivery based on various land uses and management practices. For each watershed, the annual nutrient loading is calculated based on the runoff volume and the pollutant concentrations in the runoff water as influenced by factors such as the land use distribution and management practices. The annual sediment load (sheet and rill erosion only) is calculated based on the Universal Soil Loss Equation (USLE) and the sediment delivery ratio. The sediment and pollutant load reductions that result from the implementation of BMPs are computed using the known BMP efficiencies." (U.S. Environmental Protection Agency - STEPL - Spreadsheet Tool for Estimating Pollutant Load Region 5 Load Estimation Model).

STEPL does not provide modeling for all BMPs chosen by the Steering Committee.

Cover Crop efficiencies were calculated using the USEPA Region 5 Model for load reductions.

> "Region 5 Model is an Excel workbook that provides a gross estimate of sediment and nutrient load reductions from the implementation of agricultural and urban BMPs. The algorithms for non-urban BMPs are based on the "Pollutants controlled: Calculation and documentation for Section 319 watersheds training manual" (Michigan Department of Environmental Quality, June 1999)" (U.S. Environmental Protection Agency - STEPL - Spreadsheet Tool for Estimating Pollutant Load Region 5 Load Estimation Model).

It is very important to understand that these are only estimates for BMP effectiveness and that the results will vary by field within the watershed. However by combining several BMPs within the watershed an increase in effectiveness will be realized. The actual number and types of BMPs implemented and associated removal efficiencies and costs will depend upon several factors including site specific conditions, identification of willing land owners and available resources.

Load reduction calculations for BMPs other than those listed in Tables6-9 through 6-14 are not available using the Region 5 Model or STEPL, however, it is known that all of the BMPs chosen for this Watershed Management Plan target nonpoint sources of nutrients, sediment and/or *E. coli*. For instance using precision nutrient application would potentially reduce *E. coli*, nitrogen, and total phosphorus run-off by 100% on any field it was applied to, however load reductions are not available using the models for this practice.

As stated previously in this plan (Page 3-54), the Middle Eel River is receiving water from the upper reaches of the Eel River Watershed high in nutrients, E. coli and TSS. In order to meet the goals of this plan, it will be necessary to combine BMPs and to expand this project to the upper reaches of the Eel River Watershed.

Table 6-9. Middle Eel River Watershed Nitrate 2010 Loads and reductions necessary to reach intermediate and long-term goals at the Mexico Gage Station.

Middle Eel River Subwatershed at Mexico **169,480 Acres**	**Actual Nitrate 2010 Average Load**	**Intermediate Average Target Load at 1.266 mg/L**	**Load Reduction to meet Intermediate Goal**	**Long-Term Average Target Load at 0.633 mg/L**	**Load Reduction to meet long-term goal from Intermediate Goal**
Daily Load Lbs/Day	18,082	5,133	12,949	2,567	2,566
Annual Load Lbs/Year	6,599,930	1,873,545	4,726,385	936,955	936,590

Table 6-10. Middle Eel River Watershed Nitrate load reductions estimated for Best Management Practices applied to a one acre area in the Middle Eel River Watershed.

Best Management Practice	**Estimated Nitrogen Load Reduction**	**Nitrate Lbs/year reduction when applying to a one acre area within the watershed**	**Estimated acres to reach Nitrate Intermediate Goal of 1.266 mg/L**	**Estimated acres to reach Nitrate long-term Goal of 0.633 mg/L from Intermediate Goal**
Filter Strip	70%	12.2	387,408	76,770
Reduced Tillage	55%	12.6	375,122	74,332
Streambank Stabilization	75%	13.7	344,992	68,364
Waste Management	80-100%	967	4,888	968
Cover Crop	n/a	200	23,632	4,683
Cover Crop with Filter Strip	n/a	427	11,069	2,193

Table 6-11. Middle Eel River Watershed Total Phosphorus 2010 Loads and reductions necessary to reach intermediate and long-term goals at the Mexico Gage Station.

Middle Eel River Subwatershed at Mexico **169,480 Acres**	**Actual Total Phosphorus 2010 Average Load**	**Intermediate Average Target Load at 0.152 mg/L**	**Load Reduction to meet Intermediate Goal**	**Long-Term Average Target Load at 0.076 mg/L**	**Load Reduction to meet long-term goal**
Daily Load Lbs/Day	4,278	616	3,662	308	3,970
Annual Load Lbs/Year	1,561,470	224,840	1,336,630	112,420	1,449,050

Table 6-12. Middle Eel River Watershed Total Phosphorus load reductions estimated for Best Management Practices applied to a one acre area in the Middle Eel River Watershed.

Best Management Practice	**Estimated Total Phosphorus Load Reduction**	**Total Phosphorus Lbs/year reduction when applying to a one acre area within the watershed**	**Estimated acres to reach Total Phosphorus Intermediate Goal of 0.152 mg/L**	**Estimated acres to reach Total Phosphorus long-term Goal of 0.076 mg/L from Intermediate Goal**
Filter Strip	75%	3.7	361,251	30,384
Reduced Tillage	45%	4.0	334,157	28,105
Streambank Stabilization	75%	4.1	326,007	27,419
Waste Management	90%	339.4	3,938	331
Cover Crop	n/a	100	13,366	1,124
Cover Crop with Filter Strip	n/a	214	6,246	525

Table 6-13. Middle Eel River Watershed TSS 2010 Loads and reductions necessary to reach intermediate and long-term goals at the Mexico Gage Station.

Middle Eel River Subwatershed at Mexico **169,480 Acres**	**Actual TSS 2010 Average Load**	**Intermediate Average Target Load at 50 mg/L**	**Load Reduction to meet Intermediate Goal**	**Long-Term Average Target Load at 25 mg/L**	**Load Reduction to meet long-term goal**
Daily Load Tons/Day	241	101	140	51	190
Annual Load Tons/Year	87,965	36,865	51,100	18,615	69,350

Table 6-14. Middle Eel River Watershed TSS load reductions estimated for Best Management Practices applied to a one acre area in the Middle Eel River Watershed.

Best Management Practice	**Estimated TSS Load Reduction**	**TSS Tons/year reduction when applying to a one acre area within the watershed**	**Estimated acres to reach TSS Intermediate Goal of 50 mg/L**	**Estimated acres to reach TSS long-term Goal of 25 mg/L from Intermediate Goal**
Filter Strip	65%	2.6	19,654	7,019
Reduced Tillage	75%	3.0	17,033	6,083
Streambank Stabilization	75%	3.0	17,033	6,083
Waste Management	0%	0	n/a	n/a
Cover Crop	n/a	85	601	215
Cover Crop with Filter Strip	n/a	177	289	103

6.5 Best Management Practices chosen by the Steering Committee for Cost-Share Program

In order to meet the above mentioned reductions in nutrients, sediment, and *E. coli* the best management practices (BMPs) listed in Figure 6-1 have been chosen by the Steering Committee to be included in the Cost-Share Program. Cost-share participants will be encouraged to use a systems approach which is anticipated to provide the most significant decreases in the parameters of concern.

Practice Code	Conservation Practice	Target Pollutant	Unit	Ave. Cost per Unit	75% Cost-Share
472	Access Control	*E. coli*, nutrients	Ac.	75.00	56.25
316	Animal Mortality Facility	*E. coli*	Animal Unit	1013.00	760.00-Cap $22,000.00
342	Critical Area Planting	Sediment	Ac.	862.00	646.50
340	Cover Crops	Sediment, nutrients	Ac.	41.33	31.00
	Equipment Modification (Conservation Tillage, Cover Crops, and /or Precision Nutrient Application)	Sediment, *E. coli*, nutrients	No.		Cap $10,000.00
382	Fence	*E. coli*, nutrients	Ft.	1.00	.75
393	Filter Strip	Sediment, nutrients	Ac.	150.00	112.50
410	Grade Stabilization Structure	Sediment	No.	4,455.00	3,341.25
412	Grassed Waterway (with Erosion Control Blanket)	Sediment, nutrients	Ac.	8,400.00	6,300.00
561	Heavy Use Area Protection	Sediment	Sq. Ft.	1.00	0.75
468	Lined Waterway Outlet	Sediment, nutrients	Ft.	43.00	32.25
590	Nutrient Management	Nutrients	Ac.	22.00	16.50
582	Open Channel (2-Stage Ditch)	Sediment, nutrients	Ft.	21.33	16.00
512	Pasture & Hay Planting	Sediment, nutrients	Ac.	246.66	185.00
516	Pipeline	Sediment	Ft.	2.00	1.50
528	Prescribed Grazing	Sediment, nutrients	Ac.	25.00	18.75
329/345	Residue Mngt. No Till	Sediment, nutrients	Ac.	21.00	15.75
329/345	Residue Mngt. Mulch Till	Sediment, nutrients	Ac.	8.00	6.00
290	Riparian Herbaceous Cover	Sediment, nutrients	Ac.	321.00	240.75
578	Stream Crossing	*E. coli*, nutrients	No.	4,043.00	3,032.50
585	Strip Cropping	Sediment, nutrients	Ac.	4.00	3.00
587	Structure for Water Control	Nutrients	No.	1,191.00	893.25
612	Tree & Shrub Establishment	Sediment, nutrients	Ac.	523.00	392.25
620	Underground Outlet	Sediment	Ft.	5.00	3.75
313	Waste Storage Facility	*E. coli*, nutrients	Sq. Ft.	Varies	Varies
633	Waste Utilization	*E. coli*, nutrients	Ac.	42.00	31.50

638	**Waste & Sediment Control Basin**	**Sediment, nutrients**	**No.**	**2,011.00**	**1,508.25**
614	**Watering Facility**	***E. coli*, nutrients**	**No.**	**923.00**	**692.25**
657	**Wetland Restoration**	**Sediment, nutrients**	**Ac.**	**2,231.00**	**1,673.25**

Figure 6-1. Best Management Practices (BMPs) chosen by the Steering Committee to address parameters of concern (nutrients, TSS an *E. coli*) within the Middle Eel River Watershed.

6.6 Monitoring Effectiveness

Progress and success of this Watershed Management Plan will be monitored through indicators. These indicators may be administrative such as the tracking of best management practices acreage, or programmatic such as the number of educational events and the number of participants attending these events. The timeline and specific indicators of success are outlined in the goals on pages 6-9 through 6-18. By monitoring these indicators it will be possible to determine the level of success of this plan. Monitoring progress can be general or very specific such as increasing the number of participants at events or through improvements observed in biological and/or chemical measurements. Maintaining a list of successful programs and tracking the number and acreage of best management practices as a result of this plan will help keep the momentum of the planning effort moving forward.

6.6.1 Goal Monitoring

For each goal, it is suggested that progress toward meeting each indicator listed on pages 6-9 through 6-18 be documented on a biannual (twice a year) basis by the Steering Committee of the Middle Eel River Watershed Initiative. Tracking the progress for each milestone will help to maintain focus on goal objectives and progress, in addition identify tasks that may need to be adjusted or modified to achieve the goal objective.

6.6.2 Plan Evaluation

The Middle Eel River Watershed Initiative Steering Committee will be responsible for the regular review and update of the Watershed Management Plan. The Plan should be evaluated on a biannual basis to document progress; assess effectiveness; modify activities; and keep implementation of the plan on schedule. The plan should be revised as needed by the Steering Committee to better meet the needs of the stakeholders and to meet water quality goals.

6.6.3 Water Monitoring

Water monitoring will be carried out according to the QAPP for the duration of the Grant period (2009-2012) by Manchester College. Additional grant funding will be requested in order to continue the water monitoring program (approximately $50,000/year) and document the effectiveness of BMPs and the Watershed Management Plan.

6.6.4 Contact Information

Questions regarding the Watershed Management Plan should be directed to:

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